Total Access® 1500 FXS/DPO Access Module
Installation and Maintenance Practice

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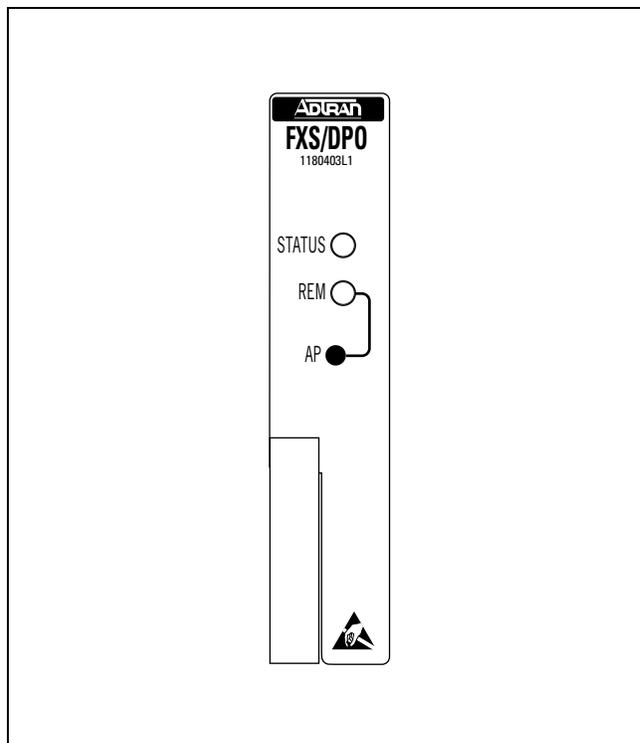
FIGURES

TABLES

Figure 1. FXS/DPO

1. GENERAL

This practice is an installation and maintenance guide for the ADTRAN® Total Access® 1500 Foreign Exchange Station/Dial Pulse Originate (FXS/DPO) access module. **Figure 1** illustrates the FXS/DPO (P/N 1180403L1) front panel.

Revision History

This is the second revision of this practice. This release of the document includes the addition of the NBOC option and the TO w/SC operating mode precipitated by Line Interface Unit (LIU) software updates to R36 or later. Time slot and wiring interconnect information for the 19-inch and 23-inch Total Access 1500 chassis and hardware and software provisioning information has been included. This revision reflects a general document update and change to the Warranty information.

Description

The FXS/DPO is designed specifically for the Total Access 1500 chassis and is not used in any other product. The FXS/DPO provides for a 2-wire analog interface between a Voice Frequency (VF) transmission and signaling facility and the Total Access 1500 Pulse Code Modulation (PCM) backplane. The FXS interface provides for simultaneous signaling in each direction for use with 2-wire Off-Premises Station Lines, carrier extended PBX Trunks, or subscriber line Foreign Exchanges using ground or loop start signaling systems. The unit is multifunctional and can be hardware or software provisioned to operate in any one of the following modes:

- Loop Start
- Ground Start
- TR08 Single Party (SP)
- TR08 Universal Voice Grade (UVG)
- TR08 Auto
- Private Line Automatic Ringdown (PLAR) D4

- PLAR D3
- Tandem
- DPO
- FX Ringdown
- TO w/Sealing Code

Features

The basic features of the FXS/DPO include the following:

- μ-law encoding and decoding
- Supports ground start, loop start, PLAR, DPO, and Tandem, TR08SP, TR08UVG, TR08AUTO, and FX Ringdown
- Supports 900 ohms (+2.16 μF) and 600 ohms (+2.16 μF) 2-wire VF interfaces
- Receive TLP range of -9.0 dB to 0.0 dB
- Transmit TLP range of -7.0 dB to +9.0 dB
- Supports CLASS®
- Hot swappable
- Long loop capability: 1650 ohms nominal
- V.90 Modem compliant
- Extended temperature range of –40ºC to +65ºC
- Meets UL 60950, NEBS Level 3, PUB 43801, and GR57
- Call Forward Disconnect

Compliance

Table 1 shows the compliance codes for the FXS/DPO. The FXS/DPO is NRTL listed to the applicable UL standards. The FXS/DPO is to be installed in a restricted access location and in a Type "B" or "E" enclosure only.

The Total Access 1500 chassis frame ground terminal must be connected to an earth ground to ensure that the front panel of the FXS/DPO is properly grounded via the backplane connector.

Table 1. Compliance Codes

Code	Input	Output
Power Code (PC)	C	C
Telecommunication Code (TC)	–	X
Installation Code (IC)	A	–

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by ADTRAN could void the user's authority to operate this equipment.

2. INSTALLATION

C A U T I O N !
SUBJECT TO ELECTROSTATIC DAMAGE
OR DECREASE IN RELIABILITY.
HANDLING PRECAUTIONS REQUIRED.

After unpacking the FXS/DPO, inspect it for damage. If damage has occurred, file a claim with the carrier, then contact ADTRAN Customer Service. Refer to the *Warranty and Customer Service* section for further information. If possible, keep the original shipping container for returning the FXS/DPO for repair or for verification of shipping damage.

CAUTION

Electronic modules can be damaged by ESD. When handling modules, wear an antistatic discharge wrist strap to prevent damage to electronic components. Place modules in antistatic packing material when transporting or storing. When working on modules, always place them on an approved antistatic mat that is electrically grounded.

Instructions for Installing the Module

To install the FXS/DPO, perform the following steps:

1. If present, remove the Access Module Blank (P/N 1175099L1) from the appropriate access module slot of the Total Access chassis.

2. Pull the ejector latch, located on the lower left-hand side of the FXS/DPO front panel, from its closed position.

3. Hold the FXS/DPO by the front panel while supporting the bottom edge of the module with the ejector latch opened to engage the chassis edge.

4. Align the module edges to fit in the lower and upper guide grooves for the access module slot.

5. Slide the module into the access module slot. Simultaneous thumb pressure at the top (above the **STATUS** LED) and at the bottom (below the electrostatic caution symbol) of the module will ensure that the module is firmly positioned against the backplane of the chassis.

6. Secure the FXS/DPO in place by pushing in on the ejector latch.

When the FXS/DPO first powers up it performs the power up self-tests. Once the power up self-test is complete, the status LEDs will reflect the true state of the hardware.

Front Panel LEDs

The FXS/DPO provides front panel LEDs to display status information. See **Table 2** for a listing of the front panel LEDs and their indications.

Time Slot Assignment

For time slot assignments in the Dual T1 mode and in the Quad T1 mode, see **Table 3** on page 4. The Total Access 1500 platform can have multiple time slots in the T1 data stream assigned to each physical slot in the channel bank. The Total Access 1500 allows craft-selectable time slots using the electronic provisioning interface. The system will automatically map DS0s in the T1 as determined by the Line Interface Unit (LIU) operational configuration. Manual mapping is available via the LIU menu.

Table 2. Front Panel LEDs and Switch

Label	Condition	Description
BUSY	Off	Module is in an on-hook or idle condition
	Green	Module is in an off-hook or busy condition
	Yellow	Module is in a digital or metallic test
	Red	Module failure has been detected
REM	Green	Module software provisioned by Line Interface Unit (LIU)
	Off	Module hardware provisioned by Dip Switches **SW1**, **SW2**, **SW3**, and **SW4**

Switch	Description
AP	Recessed pushbutton toggles between hardware provisioning and software provisioning

Connections

Four 50-pin male amphenol connectors on the 23-inch Total Access 1500 backplane and three on the 19-inch chassis packplane provide the interconnect wiring for each of the access module physical slots. The FXS/DPO requires **P1** (Pair 1 T/R) on the 23-inch chassis. In the 19-inch chassis, Slots 1-6 use **P1**, Slots 7-12 use **P2**, and Slots 13-18 use **P3**. See Table 3 on page 4 for wiring interconnect details.

3. PROVISIONING

Provisioning options are either hardware provisioned; using DIP switches on the FXS/DPO printed circuit board, or software provisioned; using the craft interface (**ADMIN**) on the System Controller Unit (SCU).

Selection of hardware or software provisioning is determined by the front panel recessed pushbutton **AP** (see Table 2).

Table 3. Time Slot and Wiring Interconnect

Physical Slot	Associated T1/DS0			Port	Amphenol Connections		Interconnect Wiring
	Dual T1	Quad T1 (D4)	Quad T1 (D1D)		23" Chassis 1180001L1	19" Chassis 1180019L1	
1	A1	A1	A1	1	P1 - 26/1	P1 - 26/1	T/R
2	A3	A5	A9	1	P1 - 27/2	P1 - 30/5	T/R
3	A5	A9	A17	1	P1 - 28/3	P1 - 34/9	T/R
4	A7	A13	A2	1	P1 - 29/4	P1 - 38/13	T/R
5	A9	A17	A10	1	P1 - 30/5	P1 - 42/17	T/R
6	A11	A21	A18	1	P1 - 31/6	P1 - 46/21	T/R
7	A13	B1	B1	1	P1 - 32/7	P2 - 26/1	T/R
8	A15	B5	B9	1	P1 - 33/8	P2 - 30/5	T/R
9	A17	B9	B17	1	P1 - 34/9	P2 - 34/9	T/R
10	A19	B13	B2	1	P1 - 35/10	P2 - 38/13	T/R
11	A21	B17	B10	1	P1 - 36/11	P2 - 42/17	T/R
12	A23	B21	B18	1	P1 - 37/12	P2 - 46/21	T/R
13	B1	C1	C1	1	P1 - 38/13	P3 - 26/1	T/R
14	B3	C5	C9	1	P1 - 39/14	P3 - 30/5	T/R
15	B5	C9	C17	1	P1 - 40/15	P3 - 34/9	T/R
16	B7	C13	C2	1	P1 - 41/16	P3 - 38/13	T/R
17	B9	C17	C10	1	P1 - 42/17	P3 - 42/17	T/R
18	B11	C21	C18	1	P1 - 43/18	P3 - 46/21	T/R
19	B13	D1	D1	1	P1 - 44/19	N/A	T/R
20	B15	D5	D9	1	P1 - 45/20	N/A	T/R
21	B17	D9	D17	1	P1 - 46/21	N/A	T/R
22	B19	D13	D2	1	P1 - 47/22	N/A	T/R
23	B21	D17	D10	1	P1 - 48/23	N/A	T/R
24	B23	D21	D18	1	P1 - 49/24	N/A	T/R

Hardware Provisioning

DIP switches **SW1**, **SW2**, **SW3**, and **SW4** are used to provision many of the FXS/DPO options. **Table 4** on page 5 summarizes the options provisioned by the DIP switches. **Figure 2** on page 6 provides a graphic detail of the four switches and the printed circuit board markings.

NOTE

Manual switches can only be used for the negative portion of the TLP range. For example, a switch setting of TX32 corresponds to –3.2 dB.

Table 4. DIP Switches

Sw.-Segment	Label	Function/Description		
1-1	D3/D4	D3 or D4 Signaling (PLAR only)		
1-2 1-3	MODE 1/OFF MODE 2/OFF	**SW1-2**	**SW1-3**	**Mode Selected**
		OFF	OFF	FXS
		OFF	MODE 2	DPO
		MODE 1	OFF	Tandem
		MODE 1	MODE 2	PLAR
1-4	GS/LS	Ground Start or Loop Start		
1-5	AUTO_TERM/OFF	Reserved for future use		
1-6	900/600	Selects the Impedance of the 2-wire interface: 900 + 2.16 µF or 600 + 2.16 µF		
1-7	RTG/OFF	Ringback Tone Generation (tandem and PLAR modes only)		
1-8	DTG/OFF	Dialtone Generation (tandem and PLAR modes only)		
2-1	DPC/OFF	Reserved for future use		
2-2 2-3 2-4 2-5 2-6 2-7 2-8	RX64/OFF RX32/OFF RX16/OFF RX08/OFF RX04/OFF RX02/OFF RX01/OFF	Receive attenuation in 0.1 dB increments (values are additive up to a total of 9.0 dB) **Example:** RX32 = 3.2 dB RX01 = <u>0.1 dB</u> 3.3 dB Total receive attenuation		
3-1	SD/OFF	Selects signaling on the loop during a Carrier Fail Alarm (CFA) SD = Busy during CFA OFF = Idle during CFA		
3-2 3-3 3-4 3-5 3-6 3-7 3-8	TX64/OFF TX32/OFF TX16/OFF TX08/OFF TX04/OFF TX02/OFF TX01/OFF	Transmit attenuation in 0.1 dB increments (values are additive up to a total of 7.0 dB) **Example:** TX32 = 3.2 dB TX01 = <u>0.1 dB</u> 3.3 dB Total transmit attenuation		
4-1	IMM/WINK	Tandem start mode: Immediate or Wink Start		
4-2	REV/NORM	Tandem battery mode: Reverse or Normal battery		
4-3 4-4 4-5 4-6 4-7 4-8	NB64/OFF NB32/OFF NB16/OFF NB08/OFF NB04/OFF NB02/OFF	Network Build Out Capacitance (NBOC) in 2 µF increments (values are additive)		

SW1		SW2		SW3		SW4	
D3	D4	DPC	OFF	SD	OFF	IMM	WINK
MODE 1	OFF	RX64	OFF	TX64	OFF	REV	NORM
MODE 2	OFF	RX32	OFF	TX32	OFF	NB64	OFF
GS	LS	RX16	OFF	TX16	OFF	NB32	OFF
AUTO_TERM	OFF	RX08	OFF	TX08	OFF	NB16	OFF
900	600	RX04	OFF	TX04	OFF	NB08	OFF
RTG	OFF	RX02	OFF	TX02	OFF	NB04	OFF
DTG	OFF	RX01	OFF	TX01	OFF	NB02	OFF

Switches SW1 through SW4 are used to select/deselect a particular "State" vice the labeled switch nomenclature of on/off.
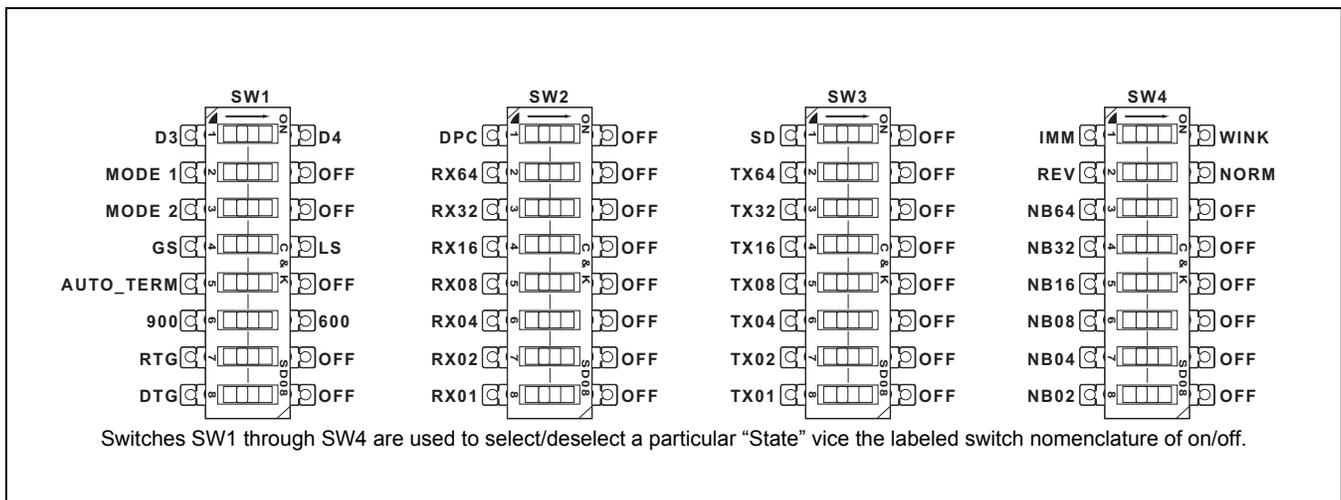
Figure 2. DIP Switches Detail

Software Provisioning

The FXS/DPO is provisioned by connecting a VT100 terminal or a computer running a terminal emulation program to the craft interface **ADMIN** port located on the System Controller Unit (SCU) front panel. Connection to the port is made via a RS-232, DB-9 cable with a male connector.

Craft port settings are as follows:

- 9600 Baud
- No parity
- 8 Data bits
- 1 Stop bit
- No Flow Control

The provisioning options for the FXS/DPO access module are described in the following tables:

- **Table 5**, *FXS/DPO General Options* on page 7
- **Table 6**, *FXS/DPO Mode Options* on page 8
- **Table 7**, *FXS/DPO Tandem Options* on page 9

Password and User ID

Password protection is a function of the SCU and is factory disabled. If password authentication is enabled, then the SCU will display the Logon screen. A valid User Name and Password are required to access the menus.

The default User Name is "user", and the default Password is "password". The User Name and Password are not case sensitive.

Menu Navigation

To traverse through the menus, select the desired entry, and press ENTER. To work backward in the menu, press the ESC (escape) key.

The menu tree in **Figure 3** on page 10 illustrates the path to every provisioning, performance, and test access point in the Total Access 1500 FXS/DPO menu

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Table 5. FXS/DPO General Options

Function	Option	Description
Mode	**Loop Start** Ground Start TR08 Single Party [3] TR08 Universal VG [3] **TR08 Auto** [3] PLAR D4 PLAR D3 Tandem [3] DPO FX Ringdown [3] TO w/SC [3]	This option selects the signaling mode of the FXS/DPO. See Table 6 for detailed descriptions of Mode Options.
2-Wire Termination	600 ohms + 2.16 µF **900 ohms + 2.16 µF**	This option selects the impedance of the 2-wire interface.
Transmit TLP	–7.0 to +9.0 dB (**+0.0**)	This is the transmit channel attenuation in 0.1 dB steps.
Receive TLP	–9.0 to +0.0 dB (**+0.0**)	This is the receive channel attenuation in 0.1 dB steps.
Trunk Processing	**Busy in CFA** Idle in CFA	This option selects signaling on the loop during a Carrier Fail Alarm (CFA).
On-Hook Messaging	Disabled **Enabled**	When On-Hook Messaging is Disabled, full battery voltage is provided to the loop when on-hook. This is utilized to provide compatibility with some station sets. Note that except for Caller ID, this prevents transmission in the on-hook state. When Enabled, a small amount of overhead voltage is reserved for AC transmission.
NBOC	0 - 126 µF (**0 µF**)	This option selects setting for Network Build Out Capacitance to balance the FXS/DPO access module to the loop. Setting should be equivalent to the additional capacitance added due to the length of the cable.
Tandem Mode Options [1]	Conversion Mode Supervision Tandem Battery Dial Tone Generation Ringback Tone Generation Forward Disconnect DNIS Protocol DNIS Delay [4]	See Table 7 for a detailed description of Tandem options.
Ringback Tone Generation [2]	Disabled **Enabled**	This option is used in PLAR D3, PLAR D4, or FX Ringdown modes only. When Enabled, the FXS/DPO provides ringback tone toward the Network.

Defaults are in bold type.

[1] Only available if Tandem Mode is selected.

[2] Only available if PLAR D3, PLAR D4, or FX Ringdown Mode is selected.

[3] Only provisionable through software provisioning (reference *Software Provisioning* on page 6).

[4] Only available if DNIS Protocol is set to DNIS Enabled or DNIS Enabled-No Answer.
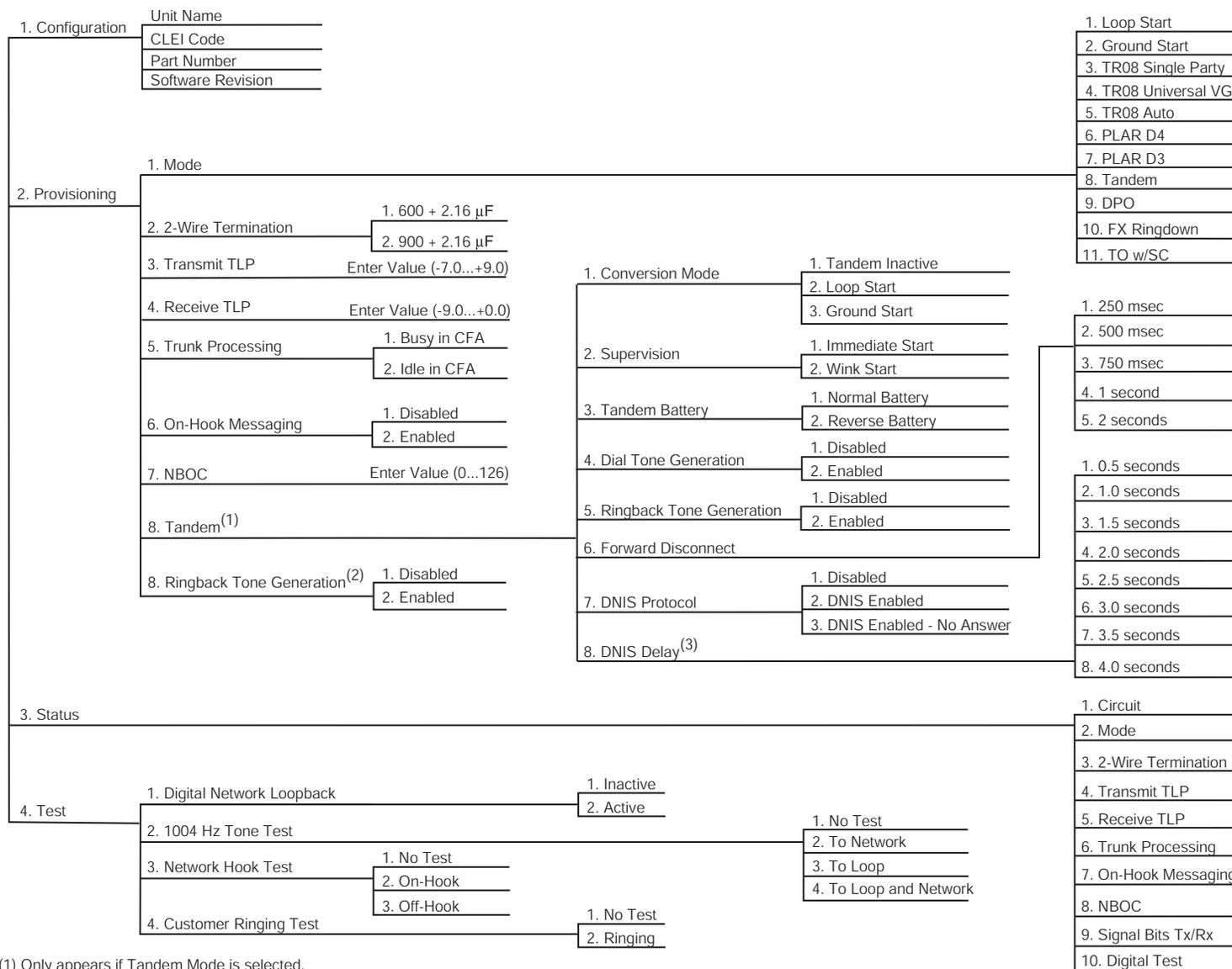
Table 6. FXS/DPO Mode Options

Mode	Description
Loop Start	This option selects ANSI T1.403 FXS Loop Start mode of operation.
Ground Start	This option selects ANSI T1.403 FXS Ground Start mode of operation.
TR08 Single Party	This option selects GR-08-Core Loop Start mode of operation.
TR08 Universal VG	This option selects GR-08-Core Ground Start mode of operation.
TR08 Auto	This option selects automatic detection of TR08 Single Party or TR08 Universal VG, based on incoming signalling.
PLAR D4	This option selects Private Line Automatic Ringdown where onhook = 00. Signaling must match the PLAR unit at the distant end.
PLAR D3	This option selects Private Line Automatic Ringdown where onhook = 11. Signaling must match the PLAR unit at the distant end.
Tandem	This option selects A/B signaling on the Network side for use with a Class 4 Tandem switch.
DPO	This option selects Dial Pulse Originate for Direct-Outward Dial applications.
FX Ringdown	This is the PLAR mode of operation that allows for a FXS Loop Start unit on the distant end.
TO w/SC	This option disables signaling for Transmission Only with Sealing Current enabled. Used in 2 w/TO applications where the Network Customer Termination Equipment (NCTE) or Customer premise equipment provide for termination of the sealing current (sealing current sink).

Table 7. FXS/DPO Tandem Options

Function	Option	Description
Conversion Mode	**Tandem Inactive** Loop Start Ground Start	This option sets the conversion from E&M (2-state) signaling on the PCM interface to loop start or ground start signaling on the loop. This option MUST be configured for channel operation, as the default value (Tandem Inactive) will not run the state machine.
Supervision	**Immediate Start** Wink Start	This option configures the E7M trunk as immediate or wink start for both the RX and TX direction. With wink start, a wink is sent back to the network from the FXS/DPO card before ringing to signal line seizure for inbound calls. For outgoing calls, a wink must be received from the switch to the FXS/DPO card to indicate trunk seizure for the call.
Tandem Battery	**Normal Battery** Reverse Battery	This option configures answer supervision for the associated voice port. Answer supervision is indicated by reverse battery polarity when Reverse Battery option is set. This is valid for outbound calls only.
Dial Tone Generation	**Disabled** Enabled	This option is used to generate a 5-second dial tone from the associated FXS/DPO port when off-hook is detected. The dial tone provided by the FXS/DPO times out after 5 seconds and is not broken by digit input.
RingBack Tone Generation	**Disabled** Enabled	When this option is enabled, a ringback tone is provided toward the Network.
Forward Disconnect	250 msec **500 msec** 750 msec 1 second 2 seconds	This option configures the amount of time battery is removed during far-end disconnect.
DNIS Protocol	**Disabled** DNIS Enabled DNIS Enabled - No Answer	This option selects or deselects DNIS support for appropriate voice/data port applications.
DNIS Delay*	0.5 seconds 1.0 second 1.5 seconds 2.0 seconds 2.5 seconds **3.0 seconds** 3.5 seconds 4.0 seconds	When DNIS is activated, this option defines the delay time between the transmitted DNIS wink, which signals off-hook/loop closure, and the off-hook sent in signaling bits.

* Only available if DNIS Protocol is set to Enabled or Enabled-No Answer.

Figure 3. FXS/DPO Menu Tree

1. Configuration
- Unit Name
- CLEI Code
- Part Number
- Software Revision

2. Provisioning
- 1. Mode
  - 1. Loop Start
  - 2. Ground Start
  - 3. TR08 Single Party
  - 4. TR08 Universal VG
  - 5. TR08 Auto
  - 6. PLAR D4
  - 7. PLAR D3
  - 8. Tandem
  - 9. DPO
  - 10. FX Ringdown
  - 11. TO w/SC
- 2. 2-Wire Termination
  - 1. 600 + 2.16 µF
  - 2. 900 + 2.16 µF
- 3. Transmit TLP
  - Enter Value (-7.0...+9.0)
- 4. Receive TLP
  - Enter Value (-9.0...+0.0)
- 5. Trunk Processing
  - 1. Busy in CFA
  - 2. Idle in CFA
- 6. On-Hook Messaging
  - 1. Disabled
  - 2. Enabled
- 7. NBOC
  - Enter Value (0...126)
- 8. Tandem [1]
  - 1. Conversion Mode
    - 1. Tandem Inactive
    - 2. Loop Start
    - 3. Ground Start
  - 2. Supervision
    - 1. Immediate Start
    - 2. Wink Start
  - 3. Tandem Battery
    - 1. Normal Battery
    - 2. Reverse Battery
  - 4. Dial Tone Generation
    - 1. Disabled
    - 2. Enabled
  - 5. Ringback Tone Generation
    - 1. Disabled
    - 2. Enabled
  - 6. Forward Disconnect
    - 1. 250 msec
    - 2. 500 msec
    - 3. 750 msec
    - 4. 1 second
    - 5. 2 seconds
  - 7. DNIS Protocol
    - 1. Disabled
    - 2. DNIS Enabled
    - 3. DNIS Enabled - No Answer
  - 8. DNIS Delay [3]
    - 1. 0.5 seconds
    - 2. 1.0 seconds
    - 3. 1.5 seconds
    - 4. 2.0 seconds
    - 5. 2.5 seconds
    - 6. 3.0 seconds
    - 7. 3.5 seconds
    - 8. 4.0 seconds
- 8. Ringback Tone Generation [2]
  - 1. Disabled
  - 2. Enabled

3. Status
- 1. Circuit
- 2. Mode
- 3. 2-Wire Termination
- 4. Transmit TLP
- 5. Receive TLP
- 6. Trunk Processing
- 7. On-Hook Messaging
- 8. NBOC
- 9. Signal Bits Tx/Rx
- 10. Digital Test

4. Test
- 1. Digital Network Loopback
  - 1. Inactive
  - 2. Active
- 2. 1004 Hz Tone Test
  - 1. No Test
  - 2. To Network
  - 3. To Loop
  - 4. To Loop and Network
- 3. Network Hook Test
  - 1. No Test
  - 2. On-Hook
  - 3. Off-Hook
- 4. Customer Ringing Test
  - 1. No Test
  - 2. Ringing

(1) Only appears if Tandem Mode is selected.
(2) Only appears if PLAR D3, PLAR D4, or FX Ringdown Mode is selected.
(3) Only appears if DNIS Protocol is enabled.

4. TEST FEATURES

The FXS/DPO supports the following tests for each port:

- Digital Network Loopback
- 1004 Hz Tone Generation
- Network Hook Test
- Customer Ringing Test

These test are used to support circuit turn-up and maintenance efforts. Test functions can be activated locally via the **ADMIN** port on the SCU, or remotely via Telnet or SNMP and are initiated on an individual port basis. The test are described below.

Digital Network Loopback Test

The Digital Network Loopback test activates a loopback path that takes the DS0 data received from the network and transmits it back to the network in the appropriate transmit time slot.

1004 Hz Tone Generation Test

The 1004 Hz Tone Generation Test generates a 1004 Hz Digital Reference Signal (DRS) tone toward the T1 network (0 dBm fixed), toward the customer loop (RX TLP setting), or both directions simultaneously. While sending the DRS tone toward the customer loop the transmit audio path (towards the T1 network) will be interrupted.

Network Hook Test

The Network Hook Test forces the AB signaling states towards the T1 network. The bits are set based upon the operating mode of the channel unit.

Customer Ringing Test

The Customer Ringing Test will activate the ports ring relay in a 2-second on and 4-second off cadence, providing ringing toward the customer's loop.

NOTE

The tests cannot run simultaneously. If a test is in progress and another test is initiated, the first test will be terminated when the new test starts.

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5. MAINTENANCE

The Total Access FXS/DPO does not require routine maintenance for normal operation.

ADTRAN does not recommend that repairs be attempted in the field. Repair services may be obtained by returning the defective unit to ADTRAN. Refer to the *Warranty and Customer Service* section for further information.

6. SPECIFICATIONS

Specifications for the Total Access FXS/DPO are detailed in **Table 8** on page 12.

7. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found at www.adtran.com/warranty.

Refer to the following subsections for sales, support, Customer and Product Service (CAPS) requests, or further information.

ADTRAN Sales

Pricing/Availability:
800-827-0807

ADTRAN Technical Support

Pre-Sales Applications/Post-Sales Technical Assistance:

800-726-8663

Standard hours: Monday - Friday, 7 a.m. - 7 p.m. CST
Emergency hours: 7 days/week, 24 hours/day

ADTRAN Repair/CAPS

Return for Repair/Upgrade:
(256) 963-8722

Repair and Return Address

Contact CAPS prior to returning equipment to ADTRAN.

ADTRAN, Inc.
CAPS Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807

Table 8. Specifications

Performance	
Loop Current:	23 mAmp nominal 20 mAmp minimum
Transmit TLP:	–7.0 to +9.0 dBm
Receive TLP:	–9.0 to 0.0 dBm
Terminating Impedance:	900 ohms +2.16 µF 600 ohms +2.16 µF
Return Loss:	ERL ≥ 28 dB SRL ≥ 20 dB
TransHybrid Loss:	ERL ≥ 34 dB SRL ≥ 20 dB
Longitudinal Balance:	≥ 58 dB @ 200 to 1000 Hz ≥ 53 dB @ 3000 Hz
Frequency Response:	±0.25 dB @ 300-3000 Hz
Idle Channel Noise:	≤ 20 dBrnCO
PCM Encoding/Decoding:	µ-law
DC Supervisory Range:	1250 ohms
Power	
Current Draw:	0.034 amps maximum @ –48 VDC
Physical	
Dimensions:	Height: 3.125 inches Width: 0.62 inches Depth: 10.1 inches
Weight:	< 0.5 pound
Environment	
Operating Temperature:	–40°C to 65°C
Storage Temperature:	–40°C to 85°C
Relative Humidity:	95 percent maximum @ 50°C, noncondensing
Maximum Heat Dissipation:	1.389 watts maximum
Compliance	
Regulatory Agency Requirements:	UL 60950 NEBS Level 3 FCC 47CFR Part 15, Class A
Part Number	
Total Access 1500 Foreign Exchange Station/Dial Pulse Originate Access Module:	1180403L1